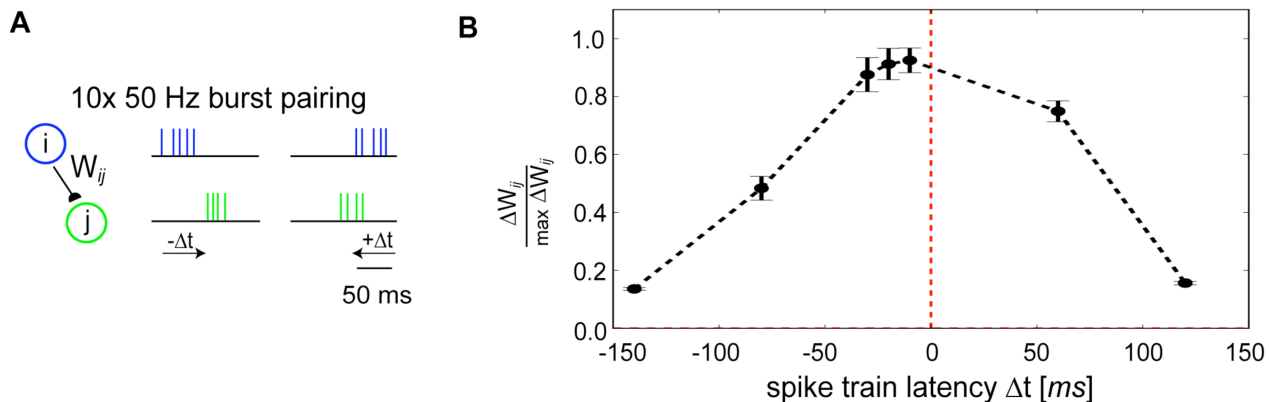


**Figure S1.** Measuring terminal  $V_m$  as a function of increasing synaptic input. **(A)**  $n_{ex}=30$  Poisson input neurons with weights  $w_{ex}=10.75$  elicit a linear increase in the mean and **(B)** a square root increase in the standard deviation of  $V_m$ . Solid lines represent the result of plotting Equation 10 directly (Kuhn, Aertsen and Rotter, 2004), and points represent the result of the NEST simulation using identical parameters. As the mean  $V_m$  is increasingly driven towards  $V_{th}=55$  mV a deviation emerges around  $f_{ex}=13$  Hz due to voltage reset in simulations, which distorts the shape of the terminal  $V_m$  distribution. Error bars depict the standard deviations after 50 simulations.



**Figure S2.** Spiking BCPNN potentiation magnitude depends on spike train overlap duration. **(A)** Schematic representation of the spike train-timing dependent plasticity conditioning protocol. Each pre (blue) - post (green) burst pairing is repeated 10 times at a frequency of 1 Hz for each time difference  $\Delta t = (-140, -80, -30, -20, -10, 60, 120)$  (Kobayashi and Poo, 2004). **(B)** Relative change in peak synaptic conductance for the BCPNN synapse using the parameters  $\tau_{z_i} = 50$  ms,  $\tau_{z_j} = 50$  ms,  $\tau_e = 100$  ms, and  $\tau_p = 10000$  ms. For each spike train, 5 pre- and 4 postsynaptic Poisson spike times were randomly generated in a 100 ms period ( $\sim 50$  Hz). Error bars represent standard deviation from 5 trials of randomly generated timings within the spike trains. Increased initial trace values de-emphasized the relevance of precise timings with respect to the overall magnitude of potentiation, as indicated by subtle differences between  $\Delta t = -30, -20$  and  $-10$ .